Patent
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In Re Application of:

Adrian Yap et al.

Serial No.	10/079,992	Group Art Unit: 2621
Filed:	02/20/2002	Examiner: Syed Y. Hasan
For:	AUDIO-VIDEO SYNCHRONIZATION FOR DIGITAL SYSTEMS	

BRIEF ON APPEAL

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P. O. Box 1450
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Sir:

The following Appeal Brief is submitted in response to the Notice of Appeal filed August 17, 2007.

I. Real Party in Interest

The real party in interest in this matter is The DIRECTV Group, Inc of El Segundo, California which is 34 percent owned by Fox Entertainment Group, which is approximately 82 percent owned by The News Corporation, Limited.

II. Related Appeals and Interferences

There are no other known appeals or interferences which will directly affect or be directly affected by or have bearing on the Board's decision in the pending appeal.

III. Status of the Claims

Claims 1-30 are pending in the application and are appealed herein.

IV. Status of Amendments

There have been no amendments filed subsequent to the response to the Final Office Action of May 18, 2007.

V. Summary of Claimed Subject Matter

The systems and methods of the following claims describe an audio-video synchronization process that offers several advantages. System complexity and cost are reduced since no additional hardware components such as a system clock reference (SCR) are needed for synchronization. Both live and recorded content can be synchronized in an identical fashion since an SCR is not required. Since little processing power is wasted in synchronizing audio and video frames, more processing power is available at the transport processor 330 to perform other functions such as encryption.

Claim 1 recites an audio-video (AV) synchronization process. The process includes determining an occupancy criterion of a buffer (354 of Fig. 1) storing received audio and video frames has been met, and if so a plurality of other steps is performed. The step of determining is described on page 13, para. 53, lines 1-7.

Once the condition of the first step has been met, several other steps are performed. The step of obtaining an initial timestamp value from an initial frame and obtaining a subsequent timestamp value from a subsequent frame is performed. This is illustrated as step S2 in Fig. 5. This is also described on page 13, para. 54, lines 1-4.

Claim 1 also recites computing an initial parameter based on the initial timestamp value, and computing a subsequent parameter based on the subsequent timestamp value. These are illustrated as steps S3 in Fig. 5 and are described on pages 13 and 14, para. 55, lines 1-6.

The method also includes determining if the computed initial and subsequent parameters coincide, and if so, another step is performed. This is described on pages 13-14, para. 55, lines 7 and 8. This is also illustrated as step S4. After the step of determining and if the condition is met, the step of outputting corresponding audio and/or video frames for decoding a display is performed. This is described on pages 13-14, para. 55, lines 9-13.

Claim 2 is also generally illustrated in Fig. 5 and depends from claim 1. Claim 2 recites, wherein the initial subsequent timestamp values are presentation timestamps of initial and subsequent video frames or presentation timestamps of initial and subsequent audio frames, each of the audio and video frames including associated audio or video data. This is described on page 13, para. 54, lines 1-4.

Claim 3 depends from claim 1 and recites that the initial and subsequent parameters are difference values, each computed as a time difference between when the corresponding timestamp is received by a processor and a time where the processor accesses a time from a system timer. This is described on pages 13-14, para. 55, lines 1-6.

Claim 4 is generally illustrated in Fig. 6 and depends from claim 3. Claim 6 recites that the step of determining compares whether difference value representing the subsequent frame (Δt_{new}) is equal to the difference value representing the initial frame (Δt_{old}). The coincidence between these difference values representing a valid timestamp of the subsequent frame. This is described on page 15, para. 60, lines 1-10 and para. 61, lines 1-6.

Claim 5 depends from claim 4 and recites that the video frame is decoded for display when the timestamp is valid. This is illustrated as step S18 in Fig. 6 and is described on page 16, para. 62, lines 3-5.

Claim 6 is dependent on claim 2 and recites that if the initial and subsequent parameters do not coincide, a recovery process is performed. This is illustrated as step S20 of Fig. 6 and is described on page 16, para. 62, line 15.

Claim 7 depends from claim 6 and recites that if the initial and subsequent parameters do not coincide because the presentation timestamp of the initial frame is corrupted but the

corresponding video is valid, or if a time base at which all presentation timestamps are obtained is changed, the video frame is decoded for display. This is described on page 16, para. 63, lines 1-6 and para. 64, lines 1-4. This is also illustrated in Fig. 7 as step S23.

Claim 8 depends from claim 6 and recites that if the initial and subsequent parameters do not coincide because both the presentation timestamp and the corresponding video data of the initial frame are corrupted, the most recently processed video frame is repeated. This is illustrated as step S22 of Fig. 7 and is described on page 16, para. 65, lines 1-3.

Claim 9 depends from claim 6 and recites that the recovery process is performed up to T times, T being a selectable parameter, and wherein if T is exceeded, the recovery process is terminated. This is illustrated as step S25 of Fig. 7 and is described on page 17, para. 66, line 13.

Claim 10 is illustrated as step S32. Claim 10 depends from claim 2 and recites that if the frames are audio frames, parameters representing a computed time are compared to a system time in order to determine if an audio frame is repeated in the process, skipped in the process or decoded for display. This is described on pages 17-18, para. 67, lines 1-13.

Claim 11 depends from claim 10 and recites that if the computed time exceeds system time by a half of an audio frame time, the audio frame is repeated. This is illustrated as step S33 of Fig. 8 and is described on pages 17-18, para. 67, lines 1-13.

Claim 12 depends from claim 10 and recites that if the computed time lags the system time by a half of an audio frame time, the audio frame is skipped. This is described on page 18, para. 68, lines 1-15 and is described as step S34.

Claim 13 depends from claim 10 and recites that if the computed time exceeds the time by less than half of an audio frame time, or lags system time by less than half an audio frame, the audio frame is decoded for display. This is described on page 18, para. 68, lines 1-4.

Claim 14 is an independent claim that corresponds in many ways to claim 1 in terms of the steps performed by the processor. Claim 14 is directed to an apparatus for synchronizing audio and video in a digital video recording (DVR) system 320. The DVR system is described on pages 5-6, para. 26, lines 1-10.

Claim 14 recites a buffer 354 for receiving a plurality of packets having data representing audio and video frames therein. This is described on page 7, para. 34, lines 1-4.

The apparatus of claim 14 also includes a processor 310 and a decoder 350, 352. The buffer, the processor and the decoder are all illustrated in Fig. 1. The processor is specifically described on page 5, para. 25, lines 1-5. The decoder is specifically described on page 8, para. 36, lines 1-11. The processor essentially performs the steps set forth in claim 1. Namely, determining whether an occupancy criterion of the buffer storing said received audio and video frames has been met. This is set forth on page 13, para. 53, lines 1-7. The processor also obtains an initial timestamp value from an initial frame and from a subsequent frame. This is described on page 13, para. 54, lines 1-4. Claim 14 also includes that the processor computes an initial and subsequent parameters based on the respective initial and subsequent timestamp values. This is described on pages 13-14, para. 55, lines 1-6. The processor of claim 14 also determines whether the computed initial and subsequent parameters coincide if the occupancy criterion is met. This is described on pages 13-14, para. 55, lines 7-8.

The decoder decodes the audio and/or video frames for display if the parameters coincide. This is described on pages 13-14, para. 55, lines 9-13. Claims 15-26 correspond nearly identical to those of claims 1-13. These claims will not be argued separately and thus are not required to be separately summarized according to the MPEP 1205.02(v).

Claim 27 is an independent claim directed to a method of synchronizing audio and video frames. The method includes computing an initial parameter based on an initial video timestamp of an initial video frame. This is described on page 13, para. 15, lines 1-4. Claim 27 also recites computing a subsequent parameter based on a subsequent video timestamp value of a subsequent video frame. This is also described on page 13, para. 15, lines 1-4.

Claim 27 also recites comparing the computed parameters, a coincidence between the two indicating a valid subsequent video timestamp. This is described on pages 13-14, para. 55, lines 1-6.

Claim 27 also includes the step of synchronizing an audio frame to the subsequent video frame based on the valid subsequent video timestamp. This is illustrated in Fig. 8 and is described on page 18, para. 68, lines 1-7.

Claim 28 depends from claim 27 and recites that the last three steps of claim 27 are repeated for all subsequent video and/or audio frames. This is described on page 4, para. 20, lines 7-9.

Claim 29 is an independent claim to a processor for synchronizing audio and video frames. Claim 29 includes a buffer for receiving a plurality of packets having data representing audio and video frames therein. The buffer is illustrated as 354 in Fig. 1. The buffer is also described on page 7, para. 34, lines 1-4. The processor also includes circuitry for performing a number of steps. These steps correspond directly to the four steps described above in claim 27. Namely, the circuitry computes an initial parameter based on an initial timestamp value of an initial video frame and computes a subsequent parameter based on a subsequent timestamp value of a subsequent video frame. These were described on page 13, para. 15, lines 1-4. The circuitry also determines whether the computed initial and subsequent parameters coincide. A coincidence between the two indicates a valid subsequent video timestamp. This is described on pages 13-14, para. 55, lines 1-6.

Claim 29 also recites that the processor synchronizes an audio frame to the subsequent video frame based on the valid subsequent video timestamp. This is described on page 18, para. 68, lines 1-6.

Claim 30 depends from claim 29 and recites that the output of the processor contains corresponding audio or video frames for decoding and display. This is described on pages 13-14, para. 55, lines 7-11.

VI. Grounds of Rejection to be Reviewed on Appeal

The following issues are presented in this appeal:

Whether Claims 1-8, 10, 14-21, 23 and 27-30 are obvious under 35 U.S.C. §103(a) over Koshino et al. (U.S. Patent No. 6,996,326) in view of Okada et al. (U.S. Patent No. 5,668,601)

Whether Claims 9 and 22 are obvious under 35 U.S.C. §103(a) over Koshino et al. in view of Okada et al. and further in view of Ueda et al. (U.S. Patent No. 6,842,580.

Whether Claims 11-13, 24-26 are obvious under 35 U.S.C. §103(a) over Koshino et al. in view of Okada et al. and further in view of Brewer et al. (U.S. Patent No. 6,262,777).

VII. Argument

Issue 1: Whether Claims 1-8, 10, 14-21, 23 and 27-30 are obvious under 35 U.S.C. §103(a) over Koshino et al. (U.S. Patent No. 6,996,326) in view of Okada et al. (U.S. Patent No. 5,668,601)

Claim 1

Claim 1 recites determining whether or an occupancy criterion of a buffer storing received audio and video frames has been met and if so obtaining an initial time stamp value from an initial frame. The Examiner points to column 3, lines 25-27 for this element. Appellants respectfully submit that notifying the completion of receiving a data block does not meet the occupancy criterion. However, even if this element is set forth in the claim, there is no conditional aspect to this element. That is, there is no consequence if the occupancy criteria are met in the Koshino reference.

In response to the above arguments, the Examiner, on page 2 of the Final Office Action, states that there is a consequence in the Koshino reference in column 3, lines 34-36 which state, "it notifies the recording-or-not-recording information whether the received data block is to be recorded in the disk drive". The Examiner then states that because of this a consequence has been established. Appellants respectfully submit that the Examiner has not fully considered the extent of claim 1. Claim 1 performs a specific step after determining whether an occupancy criterion of a buffer storing received audio and video frames has been met. The steps include obtaining an initial time stamp value from an initial frame and obtaining a subsequent time stamp value from a subsequent frame. Therefore, this limitation is not met by the Koshino reference.

Claim 1 also recites obtaining a subsequent time stamp value from a subsequent frame, computing an initial parameter based on the initial time stamp value, computing a subsequent parameter based on the subsequent time stamp value, determining if the computed initial and subsequent parameters coincide, and, if so, outputting corresponding audio and/or video frames for decoding and display. The Examiner cites column 6, lines 16-19 and lines 19-50 for meeting this criteria. Also, the Examiner cites column 7, lines 43-51 for citing that the DV frame data is time code. Appellants agree that the DV frame data recited in column 7 of the Koshino reference describes title time code particular to the DV frame data. The title time code is referred to in hours, minutes, seconds and frames.

After reviewing column 6, lines 20-50, Appellants disagree that the two obtaining steps, the two computing steps, and the determining steps are not set forth in this passage. More particularly, the steps of computing an initial parameter based on the initial time stamp value and computing a subsequent parameter based on the subsequent time stamp value are not taught or suggested. Further, the step of determining if the computed initial and subsequent parameters coincide is also not set forth. It appears that column 6 is mainly concerned about when a recording is to take place. However, no computing of parameters is set forth. The Examiner does not specifically set forth a teaching for each of these steps, but rather generally rejects each step based on column 6, lines 20-50 and column 7, lines 43-51.

In response to the above argument in the paragraph bridging pages 2 and 3 of the Office Action, the Examiner cites the Koshino reference, column 7, lines 50-54. The Examiner appears to be focused on the recording process and not a process for synchronizing audio and video signals. The Examiner clearly has not understood the scope of the several steps he says are represented by column 7, lines 52-54.

Further, the step of outputting corresponding audio and/or video frames for decoding and display is performed if the step of determining if the computed initial and subsequent parameters coincide. Thus, if the parameters do not coincide, the step of outputting is not performed. The Examiner points to the Okada reference for outputting corresponding audio and video frames for decoding and display. Neither the Koshino reference nor the Okada reference teaches the conditional aspect at the end of the determining step. Also, Appellants agree that outputting audio and video is set forth in the Okada reference. However, the outputting of audio and video frames for decoding and display is performed if the computed initial and subsequent parameters coincide. Also, Appellants respectfully submit that no teaching of frames is set forth in the Okada reference.

Claim 14

Claim 14 stands or falls together with claim 1, since claim 14 has similar limitations therein.

Claims 2 and 15

Claims 2 and 15 stand or fall together. Claim 2 recites that the initial and subsequent timestamp values are presentation timestamps of initial and subsequent video frames or presentation timestamps of initial and subsequent audio frames, each of the audio and video

frames also including associated audio or video data. The Examiner points to column 6, lines 31-34 of the Koshino reference. However, Appellants respectfully submit that no teaching is provided in this passage for presentation timestamps of initial and subsequent audio or video timeframes. Therefore, Appellants respectfully request the Board to reverse the Examiner's position with respect to these claims.

Claims 3 and 16

Claims 3 and 16 stand or fall together. Claims 3 and 16 recite that the initial and subsequent parameters are difference values, each computed as a difference time between when the corresponding timestamp is received by a processor and a time where the processor acts as a time from a system timer. Again, the Examiner points to column 6, lines 31-34 of the Koshino reference. These passages merely recite whether the absolute track number (ATN) is the same as the digital video frame stored data. Appellants respectfully submit that there is no teaching that initial and subsequent parameters are difference values. Therefore, Appellants respectfully request the Board to reverse the Examiner's position with respect to claims 3 and 16.

Claims 4 and 17

Claims 4 and 17 stand or fall together. It should be noted that claims 4 and 17 depend from claims 3 and 16, respectively. The Examiner points to column 7, lines 46-51 for this teaching. However, Appellants can find no teaching for the Δt_{new} or the coincidence between the difference values representing a valid timestamp of the subsequent frame. Appellants, therefore, respectfully request the Board to reverse the Examiner's position with respect to these claims as well.

Claims 5 and 18

Claims 5 and 18 depend from claim 4 and recite that the video frame is decoded for display when the timestamp is valid. It should be noted that claim 4 depends from claim 3 which depends from claim 1. The Examiner does not point to a specific process but refers to the rejection of claim 1 for this teaching. Appellants, therefore, respectfully request the Board to reverse the Examiner's position with respect to these claims as well.

Claims 6 and 19

Claims 6 and 19 stand or fall together. Claim 6 and 19 depend from claim 2 and recite that if the initial and subsequent parameters do not coincide, a recovery process is

performed. The Examiner points to column 6, lines 47-50 for this teaching. Claims 47-50 teach inhibiting or permitting recording. Claim 6 specifically refers to the initial and subsequent parameters are initial and subsequent timestamp values. Appellants cannot find a teaching for a recovery process in these passages. Appellants, therefore, request the Board to reverse the Examiner's position with respect to claims 6 and 19.

Claims 7 and 20

Claims 7 and 20 depend from claims 6 and 19. Claims 7 and 20 specifically recite that, when the initial and subsequent parameters do not coincide because the presentation timestamp of the initial frame is corrupted but the corresponding video data is valid or if a time base at which all presentation timestamps are obtained is changed, the video frame is decoded for display. The Examiner points to column 6, lines 47-50 for this teaching. However, as mentioned above, claims 47-50 are merely set forth for permitting and inhibiting recording. There is no teaching or suggestion for decoding the video frame. The Examiner then points to the Okada reference, Fig. 2, column 9, line 48, for an MPEG decoder. However, there is no teaching for the particular condition then decoding based on the particular conditions. Appellants, therefore, respectfully request the Board to reverse the Examiner's position with respect to claims 7 and 20.

Claims 8 and 21

Claims 8 and 21 stand or fall together. Claim 8 depends from 6 and recites that if the initial and subsequent parameters do not coincide because both the presentation timestamp and the corresponding video data of the initial frame are corrupted, the most recently processed video frame is repeated. The Examiner points to column 13, lines 64-67 of the Okada reference. Although controlling the decode circuit based upon a timestamp is set forth, there is no teaching for forming a process in response to a presentation timestamp and the video data of the initial frame being corrupted. Therefore, Appellants respectfully request the Board to reverse the Examiner's position with respect to claims 8 and 21.

Claims 10 and 23

Claims 10 and 23 depend from claims 2 and 14, respectively. Claim 10 recites that if the frames are audio frames, parameters representing a computed time are compared to a system time in order to determine if an audio frame is repeated in the process, skipped in the process or decoded for display. Again, the Examiner points to column 13, lines 61-67 of the

Okada reference for this teaching. Appellants respectfully submit that the teachings of a comparison to a system time in order to determine if an audio frame is repeated in the process, skipped in the process or decoded in display is not taught or suggested in this passage. Therefore, Appellants respectfully request the Board to reverse the Examiner's position with respect to claims 10 and 23.

Claims 27

The Examiner points to his rejection of claim 1 for the rejection of claims 27-30. Steps A, B and C are essentially set forth in claim 1. Because these elements are missing, Appellants respectfully request the Board to reverse the Examiner's position with respect to claim 21.

In addition, claim 27 recites synchronizing an audio frame to the subsequent video frame based on the valid subsequent video timestamp. Because of the way the subsequent video timestamp is calculated in the steps above, and considering the Examiner pointed to no specific teachings for this step, Appellants respectfully request the Board to reverse the Examiner's position with respect to claim 27 since a prima facie case of obviousness has not been set forth.

Claim 29

Claim 29 is similar to claim 27 and stands or falls together with claim 27.

Claim 28

Claim 28 recites repeating the steps for subsequent video and/or audio frames. Claim 28 stands or falls together with claim 27.

Claim 30

Claim 30 recites that the output of the processor contains corresponding audio and/or video frames for decoding and display. Appellants respectfully submit claim 30 stands or falls together with claim 29.

Issue 2: Whether Claims 9 and 22 are obvious under 35 U.S.C. §103(a) over Koshino et al. in view of Okada et al. and further in view of Ueda et al. (U.S. Patent No. 6,842,580)

Claims 9 and 22

Claims 9 and 22 stand or fall together. Claims 9 and 22 depend from claims 6 and 19, respectively. Both claims 9 and 22 recite that the recovery process is performed up to a T

number of times, T being a selectable parameter and wherein if T is exceeded the recovery process is terminated. While the Ueda reference teaches a recovery process for recovering from an error and terminating the process if recovery cannot be performed, there is no teaching for a selectable parameter wherein if T is exceeded the recovery process is terminated. Therefore, Appellants respectfully request the Board to reverse the Examiner's position with respect to claims 9 and 22.

Issue 3: Whether Claims 11-13, 24-26 are obvious under 35 U.S.C. §103(a) over Koshino et al. in view of Okada et al. and further in view of Brewer et al. (U.S. Patent No. 6,262,777)

Claims 11 and 24

Claims 11 and 24 depend from claims 10 and 23 which in turn depend from claims 2 and 14. Claims 11 and 24 recite that if the computed time exceeds the system time by half an audio frame time, the audio frame is repeated. The Examiner points to column 13, lines 36-38 of the Okada reference for this teaching. Appellants respectfully submit that this passage does not teach or suggest half an audio frame or any of the other limitations set forth in the dependencies.

The Examiner then cites the Brewer reference, column 3, lines 63-67 for this teaching. Although a half a frame is mentioned, the sentence containing the half a frame recites, "the first audio frame from the first audio video segment is designated as an initial audio frame when a tab error associated with the first audio frame from the first audio video segment is less than about a half of frame. There is no teaching or suggestion in this passage for the computed time exceeding the half a frame by an audio frame and then repeating an audio frame. Therefore, Appellants respectfully request the Board to reverse the Examiner's position with respect to claim 11.

Claims 12 and 25

Claims 12 and 25 recite that if the computer time lags the system by half of an audio frame time, the audio frame is skipped. Again, the Examiner points to the Brewer reference, column 3, lines 63-67 for this teaching. As mentioned above, the half an audio frame is mentioned but no teaching or suggestion is set forth for skipping the audio frame when the time lags the system time by half an audio frame. Therefore, Appellants respectfully request the Board to reverse the Examiner's position with respect to these claims.

Claims 13 and 26

Claims 13 and 26 recite that if the computed time exceeds the system time by less than half of an audio frame time, or lags system time by less than half an audio frame, the audio frame is decoded for display. The Examiner again cites column 3, lines 63-67 of the Brewer reference. Appellants respectfully submit that no teaching or suggestion is provided in that passage for decoding in response to if the computed time exceeds the system time by less than half of an audio frame time or lags a system time by less than half an audio frame. Appellants, therefore, respectfully request the Board to reverse the Examiner's position with respect to claims 13 and 26.

VIII. Claims Appendix

A copy of each of the claims involved in this appeal, namely claims 1-30, is attached as a Claims Appendix.

IX. Evidence Appendix

None

X. Related Proceedings Appendix

None.

XI. Conclusion

For the foregoing reasons, Appellants respectfully request that the Board direct the Examiner in charge of this examination to withdraw the rejections.

Please charge any fees required in the filing of this appeal to Deposit Account 50-0383.

Respectfully submitted,

Dated: 10/11/07

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CLAIMS APPENDIX

1. An audio-video (AV) synchronization process, comprising:

determining whether an occupancy criterion of a buffer storing received audio and video frames has been met, and if so

obtaining an initial time stamp value from an initial frame;

obtaining a subsequent time stamp value from a subsequent frame;

computing an initial parameter based on the initial time stamp value;

computing a subsequent parameter based on the subsequent time stamp value;

determining if the computed initial and subsequent parameters coincide, and if so

outputting corresponding audio and/or video frames for decoding and display.

2. The process of claim 1, wherein said initial and subsequent time stamp values are presentation time stamps of initial and subsequent video frames or presentation time stamps of initial and subsequent audio frames, each of the audio and video frames also including associated audio or video data.

3. The process of claim 1, wherein said initial and subsequent parameters are difference values, each computed as a time difference between when the corresponding time stamp is received by a processor and a time where the processor accesses a time from a system timer.

4. The process of claim 3, wherein said determining step compares whether the difference value representing the subsequent frame, Δt_{new}, is equal to the difference value

representing the initial frame, Δt_{old}, the coincidence between these difference values representing a valid time stamp of the subsequent frame.

5. The process of claim 4, wherein the video frame is decoded for display when the timestamp is valid.

6. The process of claim 2, wherein if the initial and subsequent parameters do not coincide, a recovery process is performed.

7. The process of claim 6, wherein if the initial and subsequent parameters do not coincide because the presentation time stamp of the initial frame is corrupted but the corresponding video data is valid, or if a time base at which all presentation time stamps are obtained is changed, the video frame is decoded for display.

8. The process of claim 6, wherein, if the initial and subsequent parameters do not coincide because both the presentation time stamp and the corresponding video data of the initial frame are corrupted, the most recently processed video frame is repeated.

9. The process of claim 6, wherein the recovery process is performed up to T times, T being a selectable parameter, and wherein if T is exceeded, the recovery process is terminated.

10. The process of claim 2, wherein if the frames are audio frames, parameters representing a computed time are compared to a system time in order to determine if an audio frame is repeated in the process, skipped in the process, or decoded for display.

11. The process of claim 10, wherein if computed time exceeds system time by a half of an audio frame time, the audio frame is repeated.

12. The process of claim 10, wherein if computed time lags system time by a half of an audio frame time, the audio frame is skipped.

13. The process of claim 10, wherein if computed time exceeds system time by less than half of an audio frame time, or lags system time by less than half an audio frame, the audio frame is decoded for display.

14. An apparatus for synchronizing audio and video in a digital video recording (DVR) system, comprising:

a buffer for receiving a plurality of packets having data representing audio and video frames therein;

a processor for determining whether an occupancy criterion of the buffer storing said received audio and video frames has been met, wherein the processor obtains an initial time stamp value from an initial frame and from a subsequent frame, computes initial and subsequent parameters based on the respective initial and subsequent time stamp values, and

determines whether the computed initial and subsequent parameters coincide if the occupancy criterion is met, and

a decoder for decoding audio and/or video frames for display if the parameters coincide.

15. The apparatus of claim 14, wherein said initial and subsequent time stamp values are presentation time stamps of initial and subsequent video frames or presentation time stamps of initial and subsequent audio frames, each of the audio and video frames also including associated audio or video data.

16. The apparatus of claim 14, wherein said initial and subsequent parameters are difference values, each computed as a time difference between when the corresponding time stamp is received by the processor and a time where the processor accesses a time from a system timer.

17. The apparatus of claim 16, wherein the processor compares whether the difference value representing the subsequent frame, Δt_{new}, is equal to the difference value representing the initial frame, Δt_{old}, the coincidence between these difference values representing a valid time stamp of the subsequent frame.

18. The apparatus of claim 17, wherein the video frame is decoded for display when the timestamp is valid.

19. The apparatus of claim 14, wherein if the initial and subsequent parameters do not coincide, the processor performs a recovery process.

20. The apparatus of claim 19, wherein if the initial and subsequent parameters do not coincide because a presentation time stamp of the initial frame is corrupted but corresponding video data of the frame is valid, or if a time base at which all presentation time stamps are obtained is changed, the video frame is decoded and displayed.

21. The apparatus of claim 19, wherein if the initial and subsequent parameters do not coincide because both a presentation time stamp and corresponding video data of the initial frame are corrupted, the most recent video frame processed is repeated.

22. The apparatus of claim 19, wherein the recovery process is performed up to T times, T being a selectable parameter, and wherein if T is exceeded, the recovery process is terminated.

23. The apparatus of claim 14, wherein if the frames are audio frames, parameters representing a computed time are compared to a system time in order to determine if an audio frame is repeated for processing, skipped for processing or decoded for display.

24. The apparatus of claim 23, wherein if computed time exceeds system time by a half of an audio frame time, the audio frame is repeated.

25. The apparatus of claim 23, wherein if computed time lags system time by a half of an audio frame time, the audio frame is skipped.

26. The apparatus of claim 23, wherein if computed time exceeds system time by less than half of an audio frame time, or lags system time by less than half an audio frame, the audio frame is decoded for display.

27. A method of synchronizing audio and video frames, comprising:

(a) computing an initial parameter based on an initial video time stamp of an initial video frame;

(b) computing a subsequent parameter based on a subsequent video time stamp value of a subsequent video frame;

(c) comparing the computed parameters, a coincidence between the two indicating a valid subsequent video time stamp, and

(d) synchronizing an audio frame to the subsequent video frame based on the valid subsequent video time stamp.

28. The method of claim 27, further comprising repeating steps (b) through (d) for all subsequent video and/or audio frames.

29. A processor for synchronizing audio and video frames, comprising:

a buffer for receiving a plurality of packets having data representing audio and video frames therein; and

circuitry for computing a initial parameter based on an initial time stamp value of an initial video frame, and for computing a subsequent parameter based on a subsequent time stamp value of a subsequent video frame,

wherein the circuitry determines whether the computed initial and subsequent parameters coincide, a coincidence between the two indicating a valid subsequent video time stamp, and

wherein the processor synchronizes an audio frame to the subsequent video frame based on the valid subsequent video time stamp.

30. The processor of claim 29, wherein an output of the processor contains corresponding audio and/or video frames for decoding and display.

IX. Evidence Appendix

None.

X. Related Proceedings Appendix

None.